

**University of Bahrain**  
**College of Information technology**  
**Department of Computer Engineering**

**Test (1)**

Student Name	
I.D. No.	
Section	

**Course Title:** Digital Logic  
**Course number:** ITCE 202-ITCE 250  
**Semester:** 2  
**Academic Year:** 2014/2015  
**Duration :** 1 hour  
**Date:** 25<sup>th</sup> March 2015

**Read the following before you start:**

1. Write your name, ID and section number
2. Answer all questions.
3. Write your answers on the attached sheets only.

Question	Mark	Mark attained
1	25	
2	25	
3	25	
4	25	
Total	100	

**Question [1]: [25 mark]**

**(a)** What is the range of signed binary numbers to be represented in 2's complement using 7-bit word length?

[3 marks]

**(b)** Perform the following operation for in 2's complement using 8-bit word.  
 $(-11)_{10} - (20)_{10} =$

[5 marks]

**(c)** Convert the following numbers showing all steps.

[3 marks each, 12 marks]

$$(671.5)_8 = ( \quad )_{16}$$

$$(59)_{10} = ( \quad )_{7-3-2-1}$$

$$(10010111)_{\text{BCD}} = ( \quad )_{\text{excess-3}}$$

$$(110111011)_{2\text{'s complement}} = ( \quad )_{1\text{'s complement}}$$

**(e)** Convert and add the following numbers in Binary Coded Decimal BCD.  
 $(175)_{10} + (286)_{10} =$

[5 marks]

**Question [2] : [25 mark]**

a. Prove algebraically:  $(\bar{X} + \bar{Y})(X \equiv Z) + (X + Y)(X \oplus Z) = (X \oplus Y) + \bar{Z}$

b. Simplify the following expression using consensus theorem only:



**b.** Express  $X_1$  in minterm expansion (decimal form).

**c.** Express  $X_2$  in maxterm expansion (decimal form).

**d.** Express  $\overline{X_3}$  in maxterm expansion (decimal form).

**Question [4]: [25 mark]**

Given  $Z(a,b,c,d) = \sum m(1,4,6,7,8,9,10,11,15) + \sum d(0,2)$

- a) Use a K-map to find the minimum Product of Sums (PoS )for Z.
- b) Indicate the essential Prime Implicants in your answer.
- c) Use a K-map to find the minimum Sum of Products (SoP) for Z.